

Features

Evaluation Module

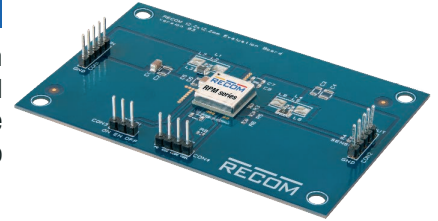
- Evaluation platform for RPM-3.0 buck regulator modules
- Thermal design considerations included
- EMI Class B filter
- Easy evaluation of trimming, sequencing, soft start, enable and sensing functions

RECOM
Evaluation Module

RPM-3.0-EVM-1

Description

The RPM3.3-3.0-EVM-1 and RPM5.0-3.0-EVM-1 generate a constant output voltage with an output current up to 3A from an external DC Source. All the functions of the RPM3.3-3.0 and RPM5.0-3.0 like trimming, sequencing, soft-start, enable and sensing can be evaluated. Also the behavior in overload or over temperature can be evaluated easily before it is designed in. There are also evaluation modules with other output currents available.



Selection Guide

| Part Number | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [A] |
|------------------|---------------------------|----------------------|--------------------|
| RPM3.3-3.0-EVM-1 | 3 - 17 | 3.3 | 3 |
| RPM5.0-3.0-EVM-1 | 3 - 17 | 5 | 3 |

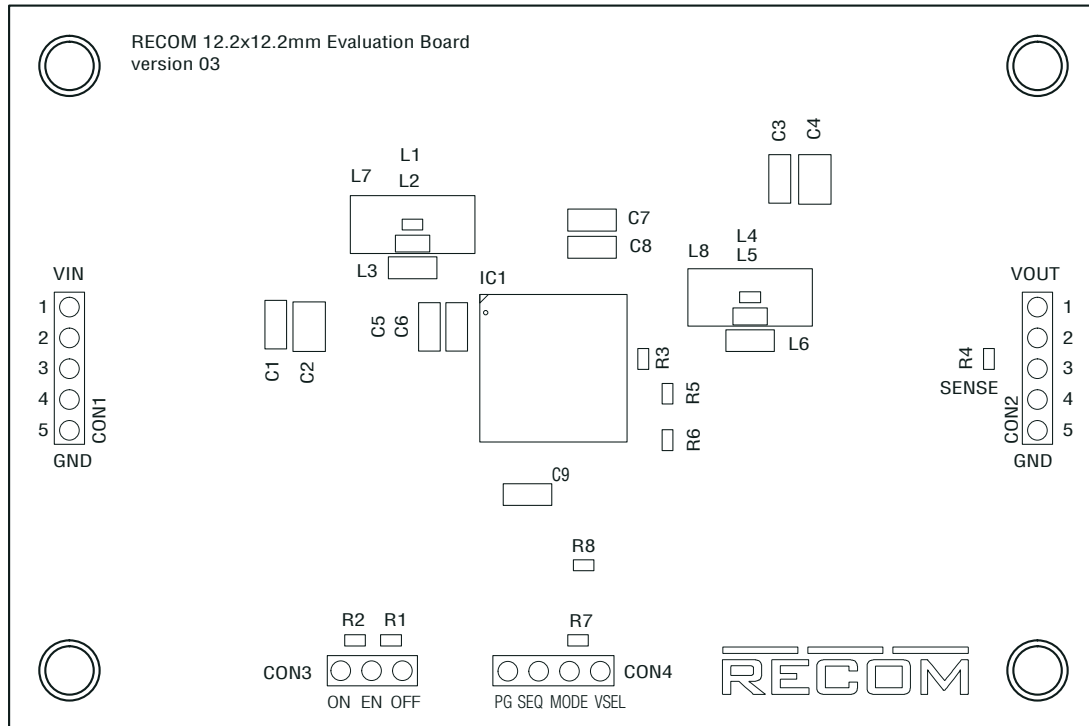
Quick Start Guide

- 1) Connect CON1 to power supply
- 2) Connect CON2 to a Load
- 3) Connect sense to the required potential
The sense preset is via R3 directly at the power module, so the preset voltage is very accurate at the output of the RPM. To equalize ohmic losses of the filter, remove the resistor at R3, and solder a 0Ω resistor at R4. To sense directly at the load, desolder R3 and R4, and connect Pin3 of CON2 to the positive potential of the load.

Notice: if voltage drop from the output to the load is too high, voltage overshoots may occur – especially during load jumps.
- 4) Disable the device via CON3
The device is preset as normally on. It can be disabled by pulling the enable pin to GND. Short R1 to disable the device.

Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

Component Placement



Connector Description

Con1

| Pin | Name | Description |
|-----|-----------------|--|
| 1,2 | V _{in} | Positive Input Voltage (observe correct polarity!) |
| 3 | NC | Not connected |
| 4,5 | GND | Negative Input Voltage (Common GND) |

Con2

| Pin | Name | Description |
|-----|------------------|---|
| 1,2 | V _{out} | Positive Output Voltage |
| 3 | SENSE | Output Voltage Sense Pin (leave open if not used) |
| 4,5 | GND | Negative Output Voltage (Common GND) |

Con3

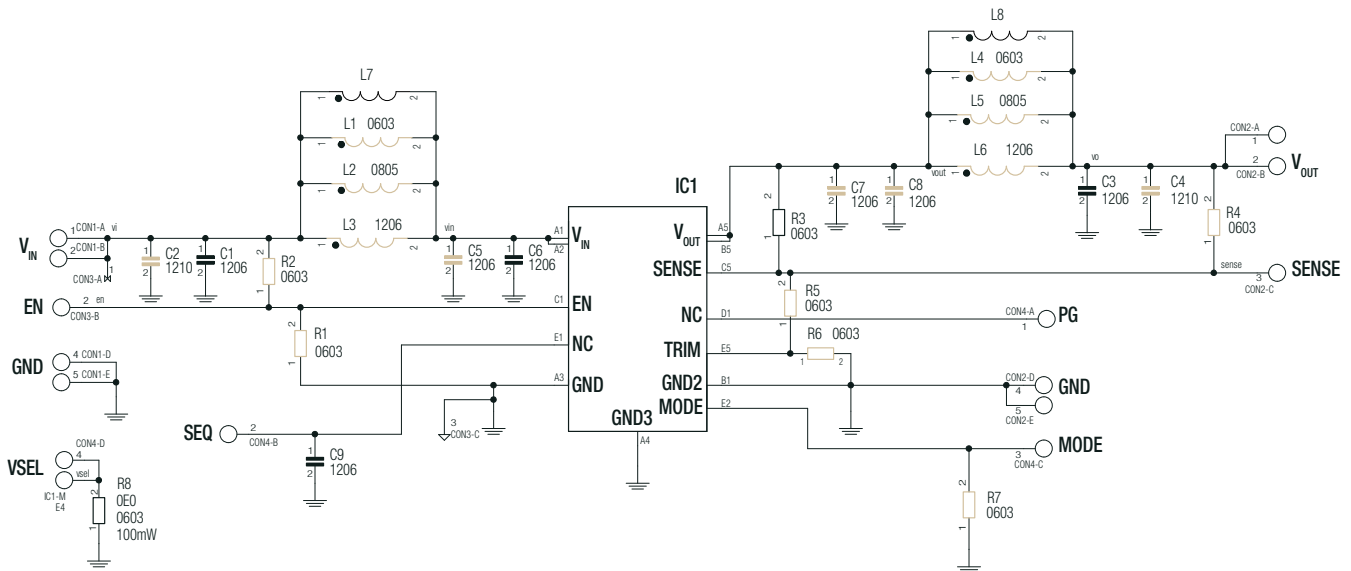
| Pin | Name | Description |
|-----|------|-------------------------------------|
| 1 | ON | Connect to Vin |
| 2 | EN | Enable Pin (leave open if not used) |
| 3 | OFF | Connected to GND |

Con4

| Pin | Name | Description |
|-----|------|---------------------------|
| 1 | PG | Power Good Signal |
| 2 | SEQ | Sequencing and soft start |
| 3 | MODE | Not used |
| 4 | VSEL | Not used |

Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

Schematic



Description

IC1: RPM-3.0 power module.

C1,C2,L1,L2,L3,L7,C5,C6: allow placement of various sized components to test input filter design. The populated filter is designed to meet EN55032 class B.

C7,C8,L4,L5,L6,L8,C3,C4: allow placement of various sized components to test output filter design. The populated filter is designed to meet EN55032 class B.

R1 and R2: configure enable pin. These resistors are not populated. The preset of IC1 is always on. Refer to IC1 datasheet for more information.

C9: sets soft-start time. Refer to IC1 datasheet for more information.

R3: populated 0Ω resistor for direct output voltage measurement. If sense is desired at a different location, for example after the filter or directly at the load, unsolder R3, and connect sense to the new measurement point.

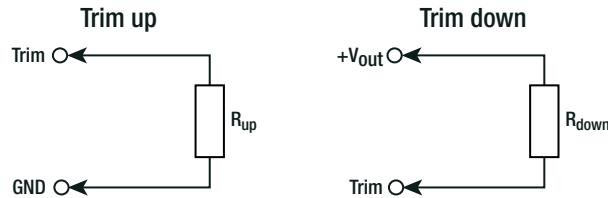
R4: sense point for output voltage after the filter. To set sense point here, remove R3 and solder a 0Ω resistor at R4.

R7 and R8: no function on this board.

R5 and R6: trim the output voltage between 0.9V and 6.0V

OUTPUT VOLTAGE TRIMMING

The RPM series offers the feature of trimming the output voltage over a range between 0.9V and 6V by using external trim resistors. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary.



- V_{out_nom} = nominal output voltage [VDC]
- V_{out_set} = trimmed output voltage [VDC]
- V_{ref} = reference voltage [VDC]
- R_{up} = trim up resistor [Ω]
- R_{down} = trim down resistor [Ω]
- R_1, R_2, R_3 = internal resistors [Ω]

| V_{out_nom} | R_1 | R_2 | R_3 | V_{ref} |
|----------------|---------------|-------------|---------------|-----------|
| 3.3VDC | 376k Ω | 1k Ω | 471k Ω | 0.81VDC |
| 5VDC | 344k Ω | | 431k Ω | |

Calculation:

$$R_{up} = \left[\frac{R_1}{V_{out_set} - V_{nom}} \right] - R_2$$

$$R_{down} = \left[\frac{(V_{out_set} - V_{ref}) \times R_3}{V_{out_nom} - V_{out_set}} \right]$$

Practical Example RPM3.3-3.0:

$$R_{up} = \left[\frac{376k}{4.3 - 3.3} \right] - 1k = \underline{\underline{375k\Omega}}$$

$$R_{down} = \left[\frac{(1.8 - 0.81) \times 471k}{3.3 - 1.8} \right] = \underline{\underline{311k\Omega}}$$

$$R_{up} \text{ according to E96} \approx \underline{\underline{374k\Omega}}$$

$$R_{down} \text{ according to E96} \approx \underline{\underline{309k\Omega}}$$

RPM3.3-3.0

Trim up

| | | | | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|------|------|--------------|
| $V_{out_set} =$ | 3.5 | 3.7 | 3.9 | 4.1 | 4.3 | 4.5 | 4.7 | 5.0 | 5.5 | 6.0 | [VDC] |
| $R_{up} (E96) \approx$ | 1M91 | 953k | 634k | 475k | 374k | 316k | 267k | 221k | 169k | 137k | [Ω] |

Trim down

| | | | | | | | | | | | |
|--------------------------|------|------|-----|------|------|------|------|------|------|------|--------------|
| $V_{out_set} =$ | 3.0 | 2.7 | 2.5 | 2.2 | 2.0 | 1.8 | 1.5 | 1.2 | 1.0 | 0.9 | [VDC] |
| $R_{down} (E96) \approx$ | 3M40 | 1M47 | 1M | 590k | 432k | 309k | 182k | 86k6 | 39k2 | 17k4 | [Ω] |

RPM5.0-3.0

Trim up

| | | | | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|------|------|--------------|
| $V_{out_set} =$ | 5.1 | 5.2 | 5.3 | 5.4 | 5.5 | 5.6 | 5.7 | 5.8 | 5.9 | 6.0 | [VDC] |
| $R_{up} (E96) \approx$ | 3M32 | 1M69 | 1M15 | 866k | 681k | 576k | 487k | 422k | 383k | 340k | [Ω] |

Trim down

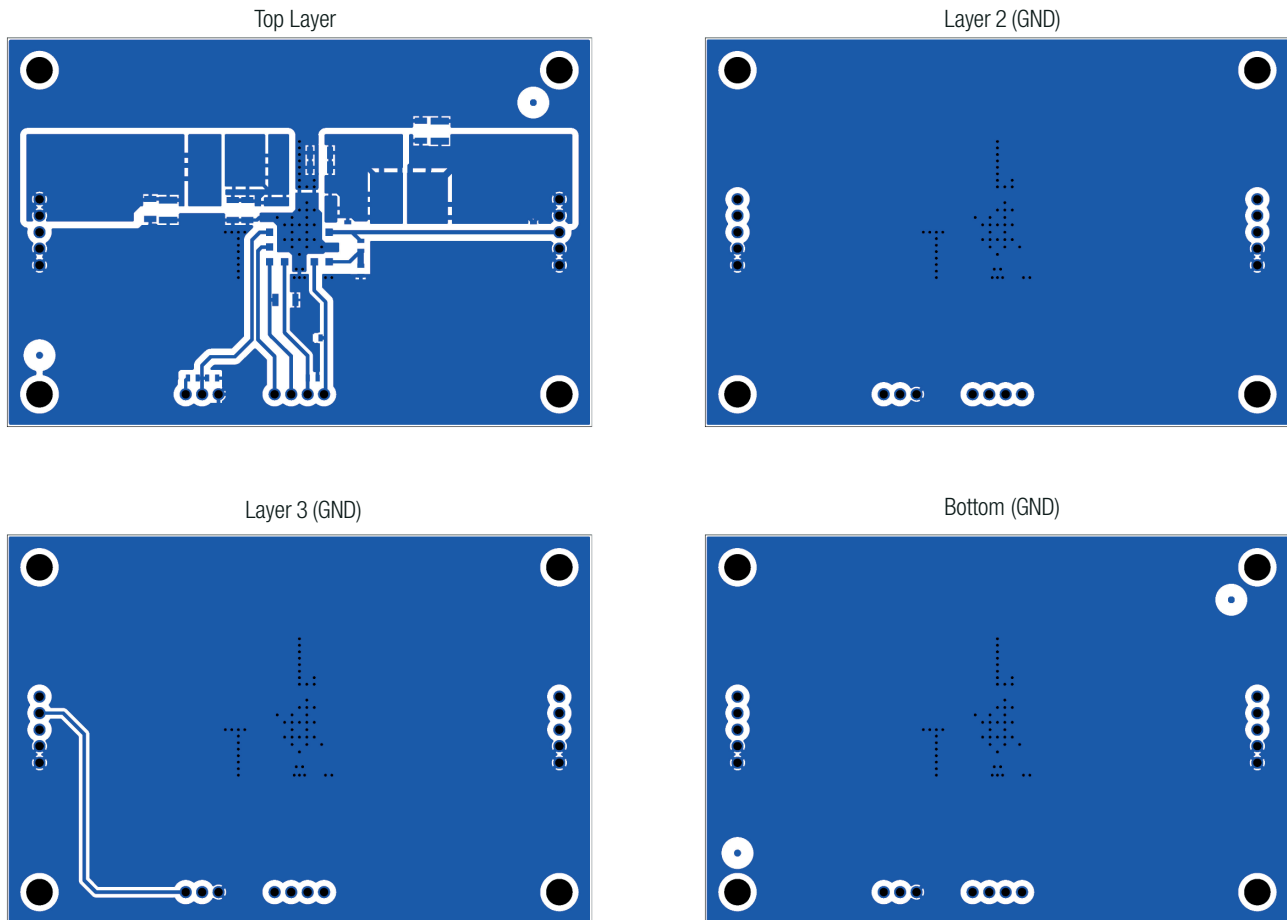
| | | | | | | | | | | | |
|--------------------------|------|------|------|------|------|------|------|------|------|------|--------------|
| $V_{out_set} =$ | 4.5 | 4.0 | 3.5 | 3.3 | 2.5 | 1.8 | 1.5 | 1.2 | 1.0 | 0.9 | [VDC] |
| $R_{down} (E96) \approx$ | 3M16 | 1M37 | 768k | 634k | 294k | 133k | 84k5 | 44k2 | 20k5 | 9k53 | [Ω] |

Specifications (measured @ Ta= 25°C, full load after warm up unless otherwise stated)

DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|-------------------|------|----------------------|
| Dimension (LxWxH) | | 90.0 x 60.0 x 26.0mm |
| Weight | | 23.3g typ. |

Layout



Notes:

Note1: Visit www.recom-power.com/eval-ref-boards to download the Gerber files

BOM

| Comp. | Description | Manufacturer Part Number | Manufacturer | Remarks |
|-------|--|--------------------------|--------------|-------------|
| C2 | 10 μ F \pm 10% 63V X7R MLCC 1210 | GRM32ER71J106KA12L | Murata | not mounted |
| C4 | 10 μ F \pm 10% 63V X7R MLCC 1210 | GRM32ER71J106KA12L | Murata | not mounted |
| C1 | 10 μ F 35V X7R 1206 | GMK316AB7106KL-TR | Taiyo Yuden | |
| C3 | 10 μ F 35V X7R 1206 | CL31B226MPHNNE | Samsung | |
| C5 | 10 μ F 35V X7R 1206 | GMK316AB7106KL-TR | Taiyo Yuden | not mounted |
| C6 | 10 μ F 35V X7R 1206 | GMK316AB7106KL-TR | Taiyo Yuden | |

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